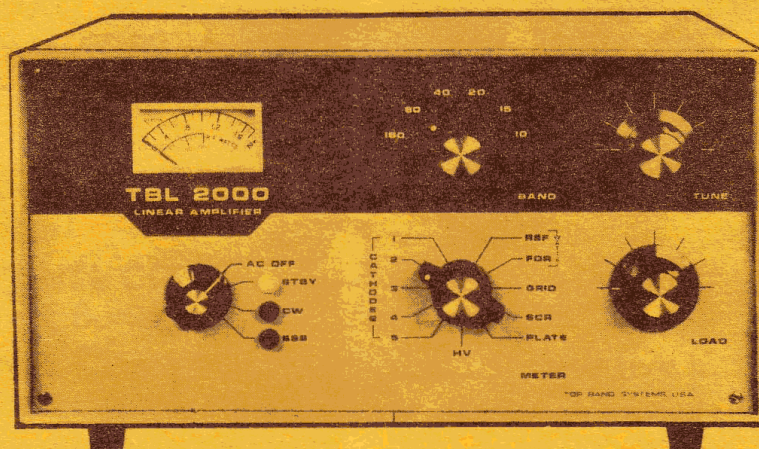


TBL 2000

LINEAR AMPLIFIER

Manual \$2.00

MODEL TBL-2000
built-in 240VAC supply
MODEL TBL-2000X
built-in 120/240VAC supply



TOP BAND SYSTEMS

SPECIFICATIONS:

BANDS: 160, 80, 40, 20, 15, and 10 meters

POWER: 1000W CW, 2000W PEP, and 700W RTTY

DRIVING POWER: 70W-150W ALC controlled

EFFICIENCY: Min. 60% on all bands (50% 10 meters)

TUBE COMPLIMENT: Five 6LF6 power pentodes

PLATE DISSIPATION: 1000W ICAS, 250W CCS

INPUT CIRCUITRY: Passive grid input, 70 ohms

THIRD ORDER PRODUCTS: -30dB down, Class AB₁

ANTENNA: 50/70 ohms nominally

AC INPUT: Model TBL-2000: 200V, 220V, 240VAC @ 8 amps 50/60Hz. Model TBL-2000X: 100V, 120VAC @ 15 amps or 200V, 220V, 240VAC @ 8 amps 50/60Hz.

WEIGHT: Model TBL-2000: 22 lb. (10Kg); Model TBL-2000X: 24 lb. (11Kg)

SIZE: 12¾" W x 11" D x 6½" H. (33cm x 28cm x 16.5cm)

FRONT PANEL CONTROLS: AC function switch, Meter switch, Band switch, Plate, and Load

SIDE PANEL CONTROLS: ALC Adjust, and five individual bias adjusts

REAR PANEL FUNCTIONS: Antenna (SO-239), Transmitter input (SO-239), T-R relay (phono), ALC (phono), AC Input socket, and 24VDC @ 300mA output for accessories (pin jack)

METER FUNCTIONS: 0-200mA each tube cathode current, 0-2A total plate current, 0-2KV high voltage, 0-200mA screen current, 0-2mA grid current, and 0-1000W forward and reverse RF watts

TABLE OF CONTENTS:

SECTION 1	SAFETY
SECTION 2	INTRODUCTION
SECTION 3	UNPACKING
SECTION 4	OPERATING LOCATION
SECTION 5	FRONT PANEL CONTROLS
SECTION 6	SIDE PANEL CONTROLS
SECTION 7	REAR PANEL CONTROLS
SECTION 8	AC CONSIDERATIONS FOR TBL-2000
SECTION 9	AC CONSIDERATIONS FOR TBL-2000X
SECTION 10	AC POWER CORDS FOR TBL-2000
SECTION 11	AC POWER CORDS FOR TBL-2000X
SECTION 12	OPERATING THE TBL-2000/TBL-2000X
SECTION 13	BIAS ADJUSTMENTS
SECTION 14	CW, RTTY, AND TUNE OPERATION
SECTION 15	SSB OPERATION
SECTION 16	ALC ADJUSTMENTS
SECTION 17	USING THE WATTMETER
SECTION 18	TUBE DATA
SECTION 19	TUBE REPLACEMENT
SECTION 20	REMOVING THE CABINET
SECTION 21	TROUBLE SHOOTING
SECTION 22	VOLTAGE CHART
SECTION 23	RESISTANCE CHART
SECTION 24	PARTS LIST
SECTION 25	PRINTED CIRCUIT BOARD (SEPARATE SHEET)
SECTION 26	SCHEMATIC OF TBL-2000 (SEPARATE SHEET)
SECTION 27	SCHEMATIC OF TBL-2000X (SEPARATE SHEET)

SECTION 1 SAFETY

WARNING:

Do not operate this equipment until the manual is completely read and understood.

One important rule must be remembered at all times when using the TBL-2000 and TBL-2000X:

ALWAYS GROUND THE LINEAR TO A GOOD
EARTH GROUND BEFORE PLUGGING THE AC
POWER CORD INTO WALL SOCKET.

The TBL-2000 and TBL-2000X use floating ground transformerless high-voltage power supplies. 1000VDC B+ is applied directly to the plates of the tubes and the B- is applied directly to the cathodes of the tubes.

No DC high-voltage is applied directly to the chassis of the amplifier. However, a good earth ground must be attached to the chassis as a safety measure.

Always use the factory supplied 3-wire AC power cords whenever possible as an added safety feature.

From the operator's standpoint, the power supply in the TBL-2000 and TBL-2000X behave identically to power supplies found in most other radio equipment.

Care must be taken at all times when servicing the interior of the linear.

Follow common practices of allowing sufficient time for the high-voltage to bleed-off before removing the linear from its cabinet.

Remember, the voltages found inside the TBL-2000 and TBL-2000X can kill!

SECTION 2 INTRODUCTION

The TBL-2000 and TBL-2000X are uniquely designed linear amplifiers operating in class AB₁ passive grid-driven service.

The TBL-2000 has a built-in power supply for 240VAC 50/60Hz operation. The TBL-2000X has a built-in 120VAC/240VAC 50/60Hz power supply. Two plug-in AC power cords are supplied with the TBL-2000X to make switching from 120VAC to 240VAC a snap.

Both amplifiers have a tube compliment of five hefty 6LF6 power pentodes. Each tube has its own side-panel bias-potentiometer for peak performance.

Operating 160 thru 10 meters, the TBL-2000 and TBL-2000X will produce input powers of 1000 watts CW, 700 watts RTTY, and 2000 watts SSB, ALC controlled.

The TBL-2000 and TBL-2000X are fully metered. With a flip of the meter switch, you can monitor the cathode currents of each tube, B+ voltage, total plate current, RF watts and much, much more.

Assembled in an elegantly styled, RF tight cabinet, the TBL-2000 weighs but 22 pounds and the TBL-2000X weighs a hearty 24 pounds.

With our efficient cooling system, the TBL-2000 and TBL-2000X will remain cool even after hours of operation.

Standard features include: built-in T/R relay, ALC adjust, two-position tilt-stand, illuminated panel meter, built-in AC power supply, and much, much more.

SECTION 3 UNPACKING

Carefully remove the linear from its shipping carton and inspect the equipment for possible signs of damage due to shipping.

If damage due to shipping is suspected, notify the transportation carrier immediately.

Check contents of shipping box for the following factory supplied accessories:

<u>QUANTITY</u>	<u>ITEM</u>
1	instruction manual
1	6' coax assembly
1	240VAC power cord assembly
1	120VAC power cord (with TBL-2000X only)
2	6' phono-plug cables
1	bias screwdriver
5	10 amp fuses, 3AG fast blow
5	15 amp fuses, 3AG fast blow TBL-2000X
5	6LF6 tubes

THE TBL-2000 AND TBL-2000X ARE SHIPPED WITHOUT THE TUBES INSTALLED IN THEIR SOCKETS.

To install the five 6LF6 power pentodes, remove the cabinet and RF cage lid as described in SECTION 20 of this manual.

Carefully insert the tubes in their sockets taking note of how the tube pins fit into the sockets.

Seat the tubes vertically into their sockets.

TAKE SPECIAL NOTE OF TUBE #1 WHICH IS LOCATED VERY CLOSE TO THE FAN BLADES. IF NECESSARY PUSH TUBE #1 AWAY FROM THE FAN TO PREVENT BLADE CONTACT.

NEVER SHIP EQUIPMENT WITH TUBES INSTALLED IN TUBE SOCKETS. ALWAYS PACK TUBES SEPARATELY.

NOTE: Equipment is shipped without fuses installed in the fuse holders.

Select 10 amp fuses for 240VAC
and 15 amp fuses for 120VAC use.

SECTION 4 OPERATING LOCATION

Placement of the amplifier is not critical; however, care must be taken not to obstruct the cabinet ventilation holes.

Cool air enters through the top and left side ventilaion holes. The air is then circulated around the power tubes by an internal 60 cfm fan. The hot air is finally blown out of the rear panel and out of the right side ventilation holes and into the ambient air.

The internal fan is run off reduced voltage for quiet operation.

The ventilation holes have been strategically placed and the cabinet will remain cool even after hours of operation.

www.everything4lessstore.com

SECTION 5 FRONT PANEL CONTROLS

AC FUNCTION SWITCH:

The AC Function Switch provides four positions of operation including; AC OFF, STANDBY, CW, and SSB. The front panel control lamps light-up for each active position. When the switch is in the AC OFF position, the power supply is disconnected from both sides of the AC line. Rotating the AC Function Switch to STANDBY inserts surge resistors in series with the line and circuit voltages come on partially. The amplifier still remains in cut-off and the exciter may still transmit directly to the antenna. Placing the AC Function Switch on CW removes the surge resistors and the linear is ready for proper CW operation. Shorting the relay jack on the rear panel now activates the internal T/R relay and the linear is put in series with the antenna line. Turning the AC Function Switch to SSB raises the screen voltage to its full potential and the amplifier is biased for class AB₁ service.

METER SELECTOR SWITCH:

The Meter Switch selects eleven different circuit functions including:

Individual tube cathodes (five).....	0-200mA	scale
High-Voltage.....	0-2KV	scale
Total plate current.....	0-2Amps	scale
Screen current.....	0-200mA	scale
Grid current.....	0-2mA	scale
Forward RF watts.....	0-1000W	scale
Reverse RF Watts.....	0-1000W	scale

BAND SWITCH:

The Band Switch selects all amateur bands from 160 through 10 meters.

TUNE:

The Tune control dips the plate current at resonance.

LOAD:

The Load control matches the output to the antenna.

SECTION 6 SIDE PANEL CONTROLS

ALC ADJUST:

The ALC potentiometer is adjusted to provide maximum performance without overdriving the linear.

BIAS ADJUSTS (five):

Each power tube in the TBL-2000 and TBL-2000X is adjusted for 30mA resting plate current by means of separate bias potentiometers.

The resting plate current of each tube may be monitored on the meter by rotating the Meter Switch from CATHODES 1 through 5 while adjusting the corresponding bias potentiometer.

SECTION 7 REAR PANEL CONTROLS

The following cables should be connected before plugging the amplifier into the wall socket.

GROUND: Connect a good earth ground to the binding post on the rear panel.

ANTENNA: Connect a suitable 50/70 ohm load to the SO-239 "ANTENNA" connector on the rear panel of the linear. The load should have an SWR of 2:1 or less. For extensive continuous duty RTTY operation, the antenna must have an SWR of 1.5:1 or less.

TRANS-MITTER: Connect the factory supplied coax cable between the exciter RF output and the SO-239 "TRANSMITTER" input on the rear panel of the linear.

ALC: Plug the factory supplied phono cable from the exciter's ALC input to the ALC output jack on the rear panel of the linear. If your exciter does not have ALC provisions, simply ignore the ALC connections.

RELAY: Plug the factory supplied phono cable from the relay jack on the rear panel of the linear to a set of normally-open, SPST contacts on the exciter. (short on transmit; open on receive)

CAUTION: THE INTERNAL T/R RELAY IN THE LINEAR IS ACTUATED BY SHORTING THE RELAY JACK TO GROUND. DO NOT APPLY ANY EXTERNAL VOLTAGE TO THE RELAY CONTROL CIRCUIT. THE AMPLIFIER'S INTERNAL RELAY IS ACTIVATED BY ITS OWN SELF-CONTAINED 24VDC SUPPLY.

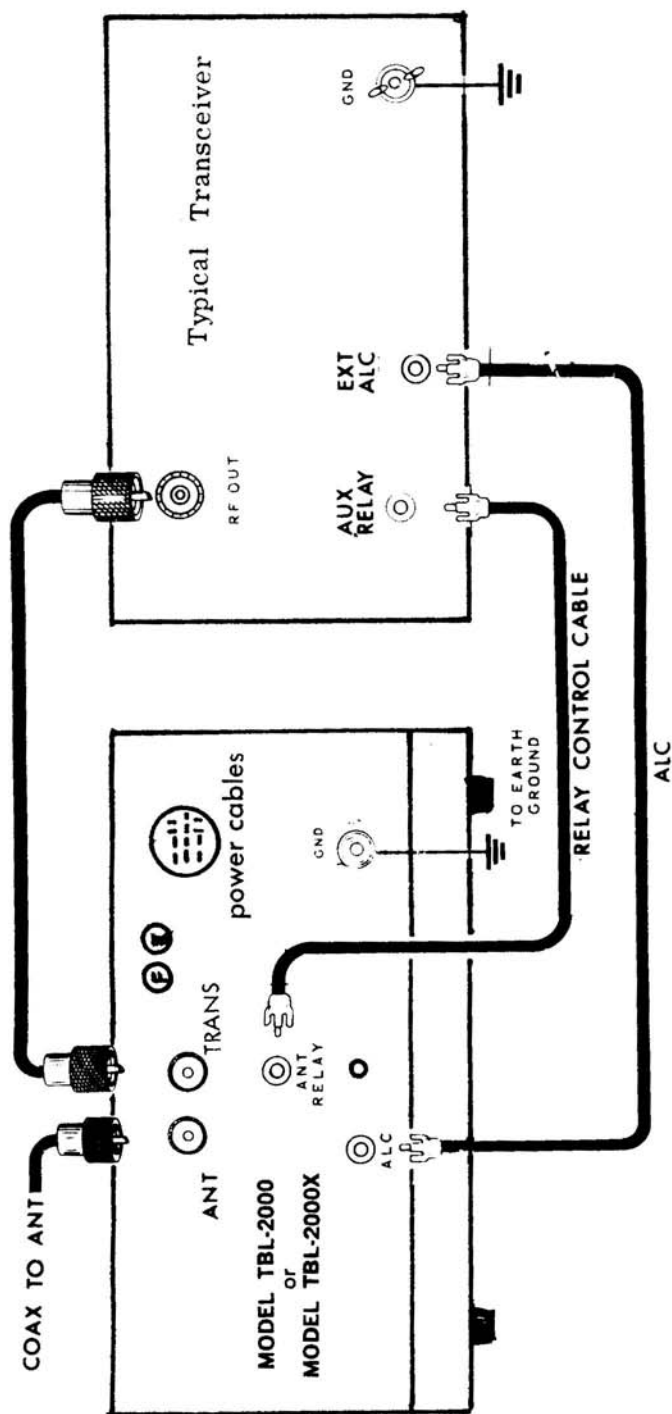
ACCESSORY

OUTPUT: +24VDC @ 300mA is available for accessory use (such as a transistorized keyer or compressor, etc.) if desired. The 24VDC (unregulated) voltage is applied through a pin jack on the rear of the linear. The 24VDC is applied to the pin jack only when the AC FUNCTION SWITCH is in CW or SSB positions. Do not short the pin jack to ground.

FUSES: The TBL-2000 and TBL-2000X are shipped without fuses installed in the fuse holders. Select the 10 amp 3AG fast blow fuses for 240VAC operation and 15 amp 3AG fast blow fuses for 120VAC operation.

Five fuses are supplied by the factory.

AC INPUT: The 12 pin Cinch-Jones plug on the rear of the TBL-2000 is wired for 240VAC operation. The 12 pin Cinch-Jones plug on the TBL-2000X is factory wired for 120VAC/240VAC operation. Simply choose the desired factory supplied power cord for 120VAC or for 240VAC and connect the power cord to the Cinch-Jones input on the rear of the amplifier.



REAR VIEW – TYPICAL INSTALLATION

SECTION 8 AC INPUT CONSIDERATIONS FOR TBL-2000

The TBL-2000 comes factory wired for operation on 240VAC (around 230VAC-250VAC). The transformer inside the TBL-2000 also has multiple primary taps for operation on 200VAC and for 220VAC.

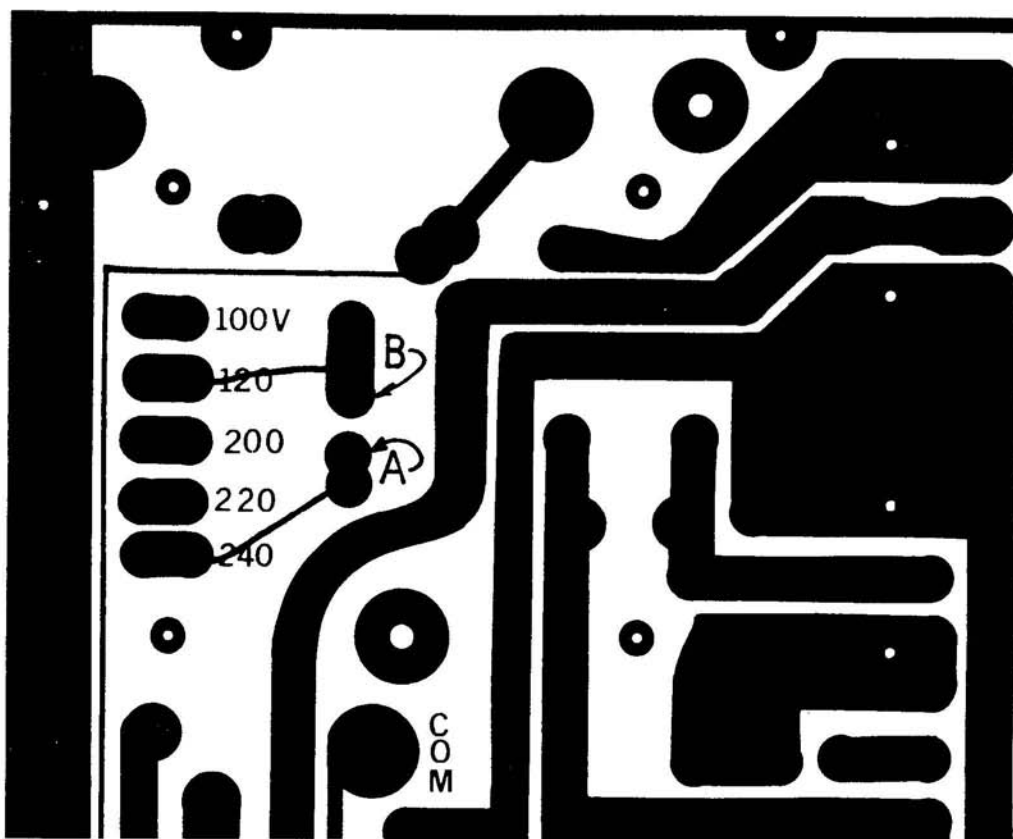
If operation on 200VAC or on 220VAC is planned, it will be necessary to rewire the power supply circuit as follows:

Remove the amplifier from its cabinet and locate the transformer primary connections on the underside of the chassis.

240VAC operation: Leave as is. Comes factory wired for operation in USA.

220VAC operation: Cut jumper going from tap A to the 240VAC tap and resolder a new jumper from tap A to the 220VAC tap. This is for operation in Europe, Africa, and most other places in the world.

200VAC operation: Cut the jumper going from tap A to the 240VAC tap and resolder a new jumper from tap A to the 200VAC tap. This is for operation in the Orient.



PARTIAL VIEW OF MAIN CIRCUIT BOARD.

TRANSFORMER PRIMARY TAPS.

SECTION 9 AC INPUT CONSIDERATIONS FOR TBL-2000X

The TBL-2000X comes factory wired for operation on 120VAC (around 110VAC-125VAC), and for operation on 240VAC (around 230VAC-250VAC). The transformer inside the TBL-2000X also has multiple primary taps for operation on 100VAC, 200VAC, and 220VAC.

If operation on voltages other than 120VAC or 240VAC is planned, it will be necessary to rewire the transformer primary as follows:

Remove the TBL-2000X from its cabinet and locate the transformer primary connections on the underside of the chassis.

100VAC operation: Cut the jumper going from tap B to the 120VAC tap and resolder a new jumper from tap B to the 100VAC tap.

120VAC operation: Leave as is. Comes factory wired for operation in USA.

200VAC operation: Cut the jumper going from tap A to the 240VAC tap and resolder a new jumper from tap A to the 200VAC tap.

220VAC operation: Cut the jumper going from tap A to the 240VAC tap and resolder a new jumper from tap A to the 220VAC tap.

240VAC operation: Leave as is. Comes factory wired for operation in USA.

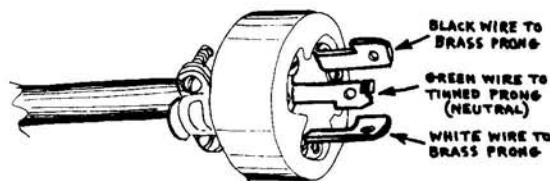
SECTION 10 AC POWER CORDS FOR THE TBL-2000

The TBL-2000 is shipped with a heavy-duty 3-wire power cord for 240VAC operation. However, because of the great variety of 240VAC receptical styles in popular use throughout the USA and the world, power cords are supplied without the 240VAC plug.

Choose a 240VAC plug to match your wall receptical and solder the plug to the power cord as shown below:

GREEN WIRE:	GROUND	AMERICAN STYLE
WHITE WIRE:	HOT	120VAC--0--120VAC
BLACK WIRE:	HOT	three wire service

GREEN WIRE:	GROUND	EUROPEAN STYLE
WHITE WIRE:	NEUTRAL	220VAC--0VAC
BLACK WIRE:	HOT	two wire service



240VAC PLUG CONNECTIONS

SECTION 11 AC POWER CORDS FOR THE TBL-2000X

The TBL-2000X is shipped with two power cords for 120VAC operation and for 240VAC operation.

The 120VAC power cord comes with a molded-on three-prong 120VAC plug for operation in the USA. For maximum safety, always use the factory supplied three-prong power cord without modification.

To rewire the 120VAC power cord to match wall recepticals found in other countries, follow the steps below:

GREEN WIRE: GROUND
WHITE WIRE: GROUND
BLACK WIRE: HOT

The 240VAC power cord supplied with the TBL-2000X is the same style cord as supplied with the TBL-2000.

Follow the instructions as described in SECTION 10 for rewiring the 240VAC power cord.

SECTION 12 OPERATING THE TBL-2000 AND TBL-2000X

PRELIMINARY SETTINGS:

With all cables attached to the rear of the linear and with a good earth ground connected to the chassis, turn the AC Function Switch to **STANDBY**.

The **STANDBY** lamp will light and the meter will be illuminated by a soft blue lamp. Turn the Meter Switch to **HV** (high voltage). Approximately 900-1000VDC should register on the panel meter.

The fan should rotate.

Turn the Meter Switch to **FORWARD WATTS** and tune the exciter for approximately 100 watts RF output. Turn the Meter Switch to **REVERSE WATTS**. If a low SWR is present on the line, practically no Reverse wattss should register on the meter.

Now return your exciter to standby and follow the instructions in **SECTION 13** for bias adjustments of the TBL-2000 and TBL-2000X.

SECTION 13 BIAS ADJUSTMENTS

Each power tube in the TBL-2000 and TBL-2000X is adjusted for 30mA resting plate current by means of separate bias potentiometers.

The resting plate current of each tube may be monitored on the meter by rotating the Meter Switch from **CATHODES 1** through **5** while adjusting the corresponding bias potentiometer.

To set the biases, turn the AC Function Switch to **STANDBY** and allow the linear to warm-up for a few minutes.

BIAS ADJUST CONTINUED:

Initially, turn all bias potentiometer fully counter-clockwise.

After the linear has been allowed to warm up, turn the AC Function Switch to SSB and actuate the internal T/R relay by shorting the relay jack to ground.

DO NOT APPLY RF DRIVE FROM THE TRANSMITTER AT THIS TIME.

Turn the Meter Switch to CATHODE 1 and adjust bias potentiometer K1 for a meter reading of 25mA to 30mA.

Now turn the Meter Switch to CATHODE 2 and adjust bias potentiometer K2 for a meter reading of 25mA to 30mA.

Repeat the above process for potentiometers K3, K4 and K5.

DO NOT ALLOW THE RESTING PLATE CURRENT TO RISE ABOVE 40mA PER TUBE.

After adjusting each tube for 30mA resting plate current, turn the Meter Switch to PLATE. The sum total of each tube's resting plate current will add up to about .150 amps.

NOTE: As the tubes age, the resting plate currents will tend to lessen. This is normal. To compensate for tube aging, periodically re-adjust the bias potentiometers.

SECTION 14 CW, RTTY, AND TUNE OPERATION

ALL TUNING MUST BE DONE WITH THE AC FUNCTION SWITCH SET TO CW. DO NOT TUNE THE AMPLIFIER IN THE SSB POSITION.

CW OPERATION:

Turn the Band Switch to the desired band of operation. Turn the AC Function Switch to STANDBY and allow the linear to warm-up for atleast one minute.

Tune your exciter for about 100 watts RF output as indicated on the FORWARD RF Wattmeter scale on the linear.

After tuning your exciter, reduce the exciter's RF ouput for zero watts output.

Turn the Meter Switch to PLATE and rotate the TUNE and LOAD controls fully counter-clockwise.

Flip the AC Function Switch to CW.

Key the exciter and raise the exciter's RF output until the linear's PLATE current reads about 1 amp.

Quickly rotate the TUNE control for a dip on the linear's PLATE meter.

Next, rotate the LOAD control slightly clock-wise until the PLATE current rises again.

Re-dip the plate current with the TUNE control.

Increase exciter output and re-dip the plate current with the TUNE control.

Continue to raise the plate current with the LOAD CONTROL and dip with the TUNE CONTROL until the PLATE meter reads 1.1 amps.

The linear is now loaded for a full 1000 watts CW input. Tuning must be done quickly.

Allow the tubes to rest a second or so between tuning steps.

Turn the Meter Switch to SCREEN. With 1000 watts CW input, approximately 40mA - 80mA screen current will flow.

Turn the Meter Switch to GRID. No grid current should flow. If some grid current is read on the meter, reduce RF drive from the exciter until grid meter reads zero.

If the linear is tuned properly, no grid current should flow.

Rotate the Meter Switch to FORWARD WATTS. With a plate current of 1.1 amps, the RF output should be at least 600 watts on all bands (500 watts on 10 meters).

RTTY:

For 700 watts RTTY, tune the linear for .75 amps on the plate meter using the CW tuning procedure as stated above.

Once the linear is resonated, you may operate a full 700 watts RTTY (1 minute on, 1 minute off).

Antenna SWR must be less than 1.5:1 for successful RTTY operation.

SECTION 15 SSB OPERATION

FOR SSB OPERATION AS WELL AS CW OPERATION, ALL TUNING MUST BE DONE WITH THE AC FUNCTION SWITCH PLACED IN THE CW POSITION. ONLY AFTER TUNING IS COMPLETED CAN THE AC FUNCTION SWITCH BE PLACED ON SSB.

For 2000 watts PEP input, tune the linear in the CW position for a plate current of 1.1 amps.

After tuning the linear in the CW position, flip the AC Function Switch to SSB.

The linear is now ready for 2KW PEP operation.

While speaking into the microphone, adjust your mike gain control so that the plate meter on the TBL-2000/TBL-2000X reads 1.0 amps on voice peaks. If some grid current flows, reduce microphone control until grid current is zero.

SECTION 16 ALC ADJUSTMENTS

For exciters with ALC provisions, proper use of the ALC control will allow peak performance with less chance of overdrive and distortion.

An oscilloscope or monitorscope measuring RF output waveforms will provide the best aid when adjusting the ALC potentiometer.

However, if a scope is not available, "on-the-air" reports can also be used to determine the best quality SSB with the least amount of distortion.

To adjust the ALC potentiometer, load the linear for full SSB operation. Turn the ALC control while speaking into the microphone. Adjust ALC potentiometer so that voice peaks indicate no more than 1 amp of plate current while speaking into the microphone. No grid current should flow.

Ignore ALC adjustments for exciters without ALC provisions.

SECTION 17 USING THE WATTMETER

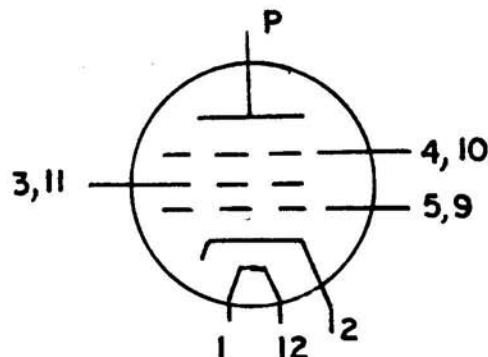
The TBL-2000 and TBL-2000X have a built-in directional RF wattmeter.

Forward power may be measured by placing the Meter Switch on FORWARD WATTS. Read forward power directly on the 0-1000 watt scale.

Reflected power may be read by placing the Meter Switch on REVERSE WATTS. Read reverse power directly on the 0-1000 watt scale.

Actual power delivered to the antenna is equal to the forward power minus the reverse power.

A low SWR on the line will yield a low reverse power, and a greater amount of power delivered to the load will result.



AMPEREX TUBE TYPE 6LF6

SECTION 18 TUBE DATA

Each of the five 6LF6 power pentodes supplied with the TBL-2000 and TBL-2000X has the following ratings:

6LF6 ratings per tube

PLATE VOLTAGE.....	990VDC
PLATE CURRENT (avg).....	500mA
PLATE CURRENT (peak).....	1400mA
PLATE DISS. (ICAS).....	200W
PLATE DISS. (CCS).....	50W
SCREEN VOLTAGE.....	330VDC
SCREEN DISS.....	9W
HEATER VOLTAGE.....	6.3V
HEATER CURRENT.....	2.0A
CATHODE TO HEATER VOLTAGE.....	200V max
MAX. BULB TEMP.....	300°C
INPUT CAPACITANCE.....	37.0pF
OUTPUT CAPACITANCE.....	18.5pF
DIMENSIONS.....	1.52" Dia x 4.9" H
BULB.....	T-12
BASE.....	12 pin
ORIGINAL MANUFACTURES:	MULLARD AND AMPEREX

SECTION 19 TUBE REPLACEMENT

To check if each power tube is handling its share of the load, tune the linear in the CW position for a plate current of .7 amps.

Flip the Meter Switch from CATHODES 1 through 5 while observing the meter readings.

Each tube should carry approximately the same amount of current, $\pm 20\%$.

Replace any tube that draws much less current than the other tubes. By the same token, replace any tube that draws much more than the other tubes.

It will seldom be necessary to replace a complete set of tubes; however, it may be a good idea to have a spare set of tubes handy to satisfy any emergency.

Follow the bias adjust procedure described in SECTION 13 before making the tube replacement test to assure that each tube draws equal amounts of resting plate current.

SECTION 20 REMOVING THE CABINET

Before removing the linear from its cabinet, set the AC Function Switch to AC OFF and allow 2 minutes for the high-voltage to bleed from the power supply filter capacitors.

WARNING: DO NOT UNPLUG AC POWER CORD FROM REAR PANEL OF THE LINEAR UNTIL THE POWER SUPPLY HIGH VOLTAGE HAS BLED FROM THE FILTER CAPACITORS. HIGH VOLTAGE MAY APPEAR ON SOME PINS ON THE CINCH-JONES AC PLUG ON REAR PANEL OF LINEAR.

After allowing two full minutes for the filter capacitors to discharge, remove the four side-panel 8-32 x $\frac{1}{2}$ " screws from the cabinet.

Carefully slide the linear out of the rear of the cabinet.

Before beginning to service the linear, short out each filter capacitor with an insulated wire to make sure that no voltage remains in the power supply.

To replace cabinet, simply slide the linear back into the cabinet and start the 8-32 x $\frac{1}{2}$ " screws in their tapped bushings; however, do not tighten the screws completely.

First, tighten the two screws on the right side (bias potentiometer side). After the right hand side is completely secure, tighten the left hand side.

To remove the RF cage lid, simply unscrew the twelve 6-32 x $\frac{3}{8}$ " screws from their tapped holes.

Replace the RF cage lid with the red "WARNING HIGH VOLTAGE" side facing upward. The ventilation holes must be directly over the fan blades.

DO NOT REPLACE THE RF CAGE LID WITH THE VENTILATION HOLES DIRECTLY OVER THE TUBES.

SECTION 21 TROUBLE SHOOTING

SYMPTOM

Transmitter loads properly when AC Function Switch is on STANDBY, but linear cannot be driven when AC Function Switch is on CW or SSB.

Linear loads to a full KW CW on 160-20 meters; however, linear exhibits slight stability on 15 and 10 meters.

Meter Switch indicates that one tube draws much less or much more than the other tubes.

Meter Switch indicates that one tube draws no cathode current or resting plate current while the other tubes work perfectly.

Meter Switch indicates one tube draws 30mA resting plate current, but draws no more current when linear is driven by exciter.

Resistors R9 or R10 smoke when linear is turned to STANDBY. Fuses blow when linear is turned to CW or SSB.

Linear is difficult to load on one or two bands.

For problems not covered on this page, please contact the factory. When writing the factory, state: Model number of linear, Serial number of linear, and Date purchased.

REASON

The transmitter has been connected to the linear's ANTENNA output rather than to the linear's TRANSMITTER input.

The linear requires more driving power on 15 and 10 meters. Always use maximum driving power whenever possible.

One tube may be defective or bias adjust has been set incorrectly for that tube.

Suspect an open cathode resistor or open screen resistor for the tube in question. Check resistors R23 thru R27 or R28 thru R32.

Suspect an open grid blocking capacitor. Check capacitors C36 thru C 40 for the tube in question.

Suspect a short in the power supply. Check diodes D1 thru D7. Check B+ line and B- line for shorts. May be a shorted by-pass capacitor.

Suspect a poor antenna. SWR must be 2:1 or less.

SECTION 22 VOLTAGE CHART

TO USE THE VOLTAGE CHART, REFER TO THE PRINTED-CIRCUIT BOARD DIAGRAM ON PAGE , AND LOCATE THE REFERENCE LETTERS WHICH DESIGNATES THE VOLTAGE TEST POINTS. AFTER FINDING THE VOLTAGE TEST POINTS ON THE CIRCUIT BOARD, MATCH THE REFERENCE LETTERS TO THE LETTERS LISTED IN THE CHART BELOW.

BEFORE MAKING VOLTAGE MEASUREMENTS, SET SWITCHES ON LINEAR AS FOLLOWS:

AC SWITCH TO SSB
BAND SWITCH TO 160M
METER SWITCH TO REVERSE WATTS

+ LEAD	-LEAD	VOLTS	COMMENTS
G	K	340VDC	
H	K	340VDC	310VDC on <u>CW</u>
J	K	1020VDC	
MM	K	30VDC	340VDC when relay on
KK	K	30VDC	" "
EE	K	30VDC	" "
AA	K	30VDC	" "
V	K	30VDC	" "
P	K	30VDC	" "
S	K	-160VDC	
T	K	-130VDC	
II	K	-90 to 130VDC	varies with bias adj.
GG	K	-90 to 130VDC	" "
CC	K	-90 to 130VDC	" "
R	K	-90 to 130VDC	" "
O	K	-90 to 130VDC	" "
UU	ground	24VDC	
U	K	-90VDC	
I	K	120VAC	
SS	ground	17VAC	
L	K	32VAC	
Q	K	0VAC	
W	K	6.3VAC	
X	K	12.6VAC	
BB	K	18.9VAC	
FF	K	25.2VAC	
E	ground	24.0VDC	

SECTION 23 RESISTANCE CHART

BEFORE MAKING RESISTANCE TEST, TURN AC SWITCH TO OFF

+LEAD	-LEAD	OHMS	COMMENTS
RR	C	2.8	
TT	C	3.3	
PP	C	8.0	
OO	C	9.3	
NN	C	10.3	
SS	W	low	across diode
SS	ground	2.2	
L	K	.4	
ground	K	INF	
G	K	13K	
H	K	13K	
I	K	380	
J	K	30K-50K	
ground	K	INF	
JJ	K	8.2	
HH	K	8.2	
DD	K	8.2	
Z	K	8.2	
M	K	8.2	
LL	K	.8	
MM	K	18K	
II	K	8K	
GG	K	8K	
CC	K	8K	
R	K	8K	
O	K	8K	
G	ground	INF	
H	ground	INF	
I	ground	INF	
J	ground	INF	
Q	ground	0-2.5K	
S	L	low	
T	K	low	
FF	L	.4	
BB	FF	.4	
X	BB	.4	
W	X	.4	
K	W	.4	
KK	MM	100	
EE	MM	100	
AA	MM	100	
V	MM	100	
P	MM	100	

LINEAR AMPLIFIER

SECTION 24 PARTS LIST

All parts are available through purchase from the factory. Parts may be purchased by the customer to be used for any purpose.

However, if parts are specifically ordered for replacement use, please include the following information with your order:

- 1) Model number of original equipment
- 2) Serial number of original equipment

The above information will aid us in finding an exact replacement for your set.

PARTS ARE **SENT** POST-PAID (IN USA) WHEN ADVANCE PAYMENT IS RECEIVED. CUSTOMER PAYS POSTAGE WHEN ORDER IS C.O.D.

MINIMUM ORDER \$2.00

TBS

TOP BAND SYSTEMS, INC

**PO Box 15015, Bryant Station
Long Beach, Ca., 90815, USA**

CAPACITORS:

NUMBER	DESCRIPTION	PRICE
C1	570mfd 350VDC computer grade	\$5.50
C2	570mfd 350VDC computer grade	5.50
C3	570mfd 350VDC computer grade	5.50
C4	1400mfd 250VDC computer grade	5.50
C5	1400mfd 250VDC computer grade	5.50
C6	1400mfd 175VDC computer grade	5.50
C7	1400mfd 175VDC computer grade	5.50
C8	.1 mfd 400V molded \pm 10%	.40
C9	1000mfd 25VDC electrolytic	.90
C10	570mfd 350VDC computer grade	5.50
C11	540pf 3 section .024" spacing	7.00
C12	1530pf 3 section .011" spacing	7.00
C13	500pf 2500VDC Mica (CM-45)	1.50
C14	2000pf 600VDC Mica (CM-45)	1.00
C15	2000pf 600VDC Mica (CM-45)	1.00
C16	540pf 3 section .024" spacing	7.00
C17	500pf 2500VDC Mica (CM-45)	1.50
C18	500pf 2500VDC Mica (CM-45)	1.50
C19	5600pf 2500WV Mica (CM-56)	3.00
C20	.001mfd 1000VDC disc ceramic	.15
C21	.001mfd 1000VDC disc ceramic	.15
C22	200pf 2KVDC disc ceramic	.45
C23	100mfd 175VDC electrolytic	1.50
C24	.005mfd 1400VDC 150VAC disc	.40
C25	.005mfd 1400VDC 150VAC disc	.40
C26-34	1200pf 500VDC feedthru	.25
C35	1.5pf - 5pf trimmer capacitor	1.00
C36-40	.0022mfd 1.4KVDC 150VAC disc	.25
C41-49	.01mfd 1KV disc ceramic	.15
C50-55	.001mfd 1KV disc ceramic	.15
C56-64	.01mfd disc seramic	.15

DIODES:

NUMBER	DESCRIPTION	PRICE
D1-6	1N4725 1000PIV 3Amps Epoxy	\$.90
D7-13	1N4004 400PIV 1Amps Epoxy	.25
D14-15	Matched set 1N270 germanium	1.00pr
D16	1N3047B 130V 1W 5% Zener	2.00
D17-19	1N270 germanium	.25

FUSES:

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
F1-2	10 Amp 3AG fast blow fuses	\$.20
F3-4	15 Amp 3AG fast blow fuses	.20

CONNECTORS:

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
J1	Cinch-Jones 12 Pin Male	\$1.00
J2	Phono jack single hole type	.50
J3	Pin jack	.25
J4-5	SO-239	.50
J6	phono jack single hole type	.50
J7	Binding post for ground	.50
J8-12	Compactron p-c tube sockets	.50

RELAYS:

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
K1	3PDT 10A 24VDC relay	\$6.00
K2	2PDT 2A 24VDC sealed	5.00
K3	2PDT 2A 24VDC sealed	5.00

INDUCTORS AND RFC:

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
L1	10-80 meter inductor	\$10.00
L2	160 meter inductor	1.50
L3	15 meter input coil	
L4	10 meter input coil	
RFC1	Plate choke 80uh 4 amps	4.00
RFC2	antenna protector 22mH	1.00
Z1-5	Parasitic suppressors	.50
L5	Wattmeter torroid coil	2.00

LAMPS, METERS, FANS:

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
LT1-3	24VDC 35mA wire lead lamps	\$1.00
LT4	24VDC 40mA bayonet blue (1819)	.75
M1	1mA 1600 ohm 100° arc meter	8.00
B1	60cfm fan	8.00

RESISTORS:

NUMBER	DESCRIPTION	PRICE
R1-7	15K 10W wire wound	\$.25
R8	1.5K 10W wire wound	.25
R9	10ohms 10W wire wound	.25
R10	10 ohm 10W wire wound	.25
R11	1.8Meg 2W \pm 5%	.25
R12	200K $\frac{1}{2}$ W 5%	.10
R13	.8 ohm 3W 5% Wire wound	.50
R14	8.2 ohm 2W 5% Wire wound	.25
R15	2.2Meg $\frac{1}{2}$ W 10%	.10
R16	200K $\frac{1}{2}$ W 10%	.10
R17	4.7K $\frac{1}{2}$ W 10%	.10
R18-22	1.5K $\frac{1}{2}$ W 10%	.10
R23-27	8.2 ohm 2W 5% wire wound	.25
R28-32	100 ohm $\frac{1}{2}$ W 10%	.10
R33-37	68 ohm 2W 10%	.25
R38	4.7K 2W 5%	.25
R39	1.3K 1W 5%	.20
R40	200K $\frac{1}{2}$ W 10%	.10
R41	68 ohm 1W 10%	.20
R42-46	10K 1/3W potentiometer	.75
R47-48	2.5K 1/3W potentiometer	.75
R49	8.2K $\frac{1}{2}$ W 5%	.15
R50	66 ohms 60 watts non-inductive	5.00
R51	2.5K 1/3W potentiometer	.75
R52	4.7K 2W 10%	.25
R53	68 ohm 2W 10% v	.25

SWITCHES:

NUMBER	DESCRIPTION	PRICE
SW1	AC Function Switch	\$10.00
SW2	Meter Switch	5.00
SW3	Band Switch	15.00

PRINTED CIRCUIT BOARDS:

NUMBER	DESCRIPTION	PRICE
PC1	TBL-2000 main circuit board	\$19.00
PC2	TBL-2000X main circuit board	\$19.00
PC3	Feedthru capacitor filter board	2.00
PC4	Wattmeter circuit board	7.00
PC5	ALC board	2.00
PC6	10/15 meter input board	2.00

All boards are 1/16" thick, two sided, glass-epoxy.

CABINET:

NUMBER	DESCRIPTION	PRICE
—	TBL-2000 front panel	\$9.00
—	TBL-2000X front panel	9.00
—	Main chassis	12.00
—	RF Cage assembly	15.00
—	RF Cage lid	4.00
—	Cabinet	38.00
—	Folding bail and feet	5.00

MISC ITEMS:

NUMBER	DESCRIPTION	PRICE
T1	Transformer: Pri 100V, 120V, 200V, 220V, 240VAC. Sec 31V @2A, 17V @ 500mA, 114V @ 50mA	\$19.00
P1	120VAC cord and socket assemb.	7.00
P2	240VAC cord and socket assemb.	7.00
—	AC Knob	1.00
—	Band Knob	1.00
—	Meter Knob	1.00
—	Tune Knob	1.00
—	Load Knob	1.00
—	6LF6 tubes (set of five)	20.00
—	Standby, CW, SSB light holders	.50
—	Meter light holder	.50
—	tube plate caps	.20
—	Instruction manual	2.00

